ONE Planet Doctoral Training Partnership

Natural Environment Research Council

Project title: The impact of artificial light at night on optimal foraging, trophic networks and ecosystem services

Ref: OP2418

Keywords: Artificial light, foraging ecology, metabarcoding, nutrition

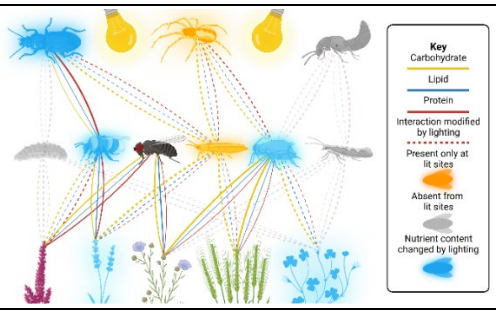
One Planet Research Theme:
Climate & Climate Change ☐ | Earth System Processes ☐ | Anthropocene ☒ | Environmental Informatics ☒

Lead Supervisor: Dr Jordan Cuff, Newcastle University

Key Research Gaps and Questions:
1) How does nutrient availability for predators and pollinators change under artificial lighting?

2) Are community structure changes under artificial light driven by foragers seeking nutritionally optimal resources or patches?

3) What is the impact of these changes on ecosystem service provision?



Background: Artificial light at night (ALAN) affects invertebrate abundance and function[1] with downstream impacts on ecological processes and ecosystem services[2] including trophic interactions[3] and nutrient cycling[4]. Nutrition and foraging are inherently linked[5] and, as these change, animals will seek optimal resources and patches[6], likely driving observed community structure changes under ALAN. This will, in turn, impact local provision of ecosystem services such as pollination and predation, thereby effecting both natural and semi-natural systems. The drivers of these changes are, however, poorly understood.

Objectives: Determine how nutrient availability changes under ALAN, how this drives changes in trophic network structure and function, and how this impacts ecosystem services (ESs) such as pollination and biocontrol.

Methodology: This project will use equipment and expertise from Newcastle University's Molecular Diagnostics Facility to identify and compare ecological interactions at paired lit and unlit sites. Using techniques such as floral eDNA and dietary metabarcoding, and nutrient analysis, this project will compare trophic interactions and nutrient contents between paired lit and unlit sites. These data will be used to construct networks[5] to determine how interactions are structured by ALAN and the consequences for ESs.

Training and development: The successful student will be embedded within Newcastle University's Ecology Group, a thriving research community, and will receive training in molecular analysis of interactions via metabarcoding, field entomology and nutritional analysis in Newcastle University's Molecular Diagnostics Facility and experimental farms. Training in ecological informatics skills including multivariate and network analyses, and bioinformatics will also be provided with opportunity to attend additional external training.

References: **1**.Boyes *et al.* (2021) *Science Advances* **2**.Macgregor *et al.* (2019) *Ecosphere*. **3**.Grubisic & Van Grunsven (2021) *Current Opinion in Insect Science*. **4**.Li *et al.* (2023) *Geoderma*. **5**.Cuff *et al.* (2022) *Authorea*. **6**.MacArthur (1966) *American Naturalist*.

Prerequisites:

We are looking for a passionate and driven student motivated to unravel fundamental ecological processes. Previous molecular experience is beneficial but not required.

For more information, please contact Jordan Cuff (jordan.cuff@ncl.ac.uk).

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